PSYCHE.

THE SPECIES OF MYRMECOPHILA IN THE UNITED STATES.

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The first species of Myrmecophila from the United States, two of them, were described by Bruner in 1884. An earlier, but probably mistaken reference to them was doubtfully made by Harris in 1841 (Ins. inj. veg., 125), where he speaks of

"minute jumping insects, rather less than one tenth of an inch long, of a broad oval shape, and black color, without wing-covers or wings, but furnished with short thick hinder thighs. . . . It is possible they may come near to the genus Myrmecophila, which was unknown to me at the time [when they were seen]; and since then these minute insects have escaped my observation."

They were distinguished from Haltica; but as some cucumber vines were "much infested" by them, as the reference to them was expunged by Harris from the second edition of his treatise, and as no species of the genus has since been recognized in New England, it is probable that these creatures had nothing to do with Myrmecophila. Fitch (Rep. ins. N. Y., vi-ix, 186) very reasonably thinks they may have been a species of Podura, but if so, the "thick hinder thighs" were a mistake of observation.

Since 1884 Bruner has recognized, named and distributed, but not described, two other species of the genus, and previously Saussure had described a species from South America (Colombia). I give here descriptions of all these North American species, together with a fifth now first recognized, and add a table for their separation. In his first description of our Myrmecophilae Bruner insists upon certain thoracic markings as a distinctive feature of *M. pergandei*. These markings occur, however, in all the species, although more noticeable in some specimens than in others; I have accordingly not mentioned them in my descriptions.

The different species are widely distributed over our country, but there are vast tracts where none are yet known to occur, although the conditions would appear wholly favorable. Two species are found on the Pacific coast west of the Sierras, one in the north, the other in the south; two others west of the Mississippi and east of the Rocky Mts., one of them having been found in Minnesota, Nebraska and northern New Mexico, the other in eastern Nebraska only; while the fifth species is confined

to the Atlantic coast from Maryland to Georgia. The interior basin between the great continental ranges, the Gulf States, and the region between the Alleghanies and the Mississippi, as well as the North Atlantic district are, so far as we yet know, uninhabited by Myrmecophila. Saussure draws attention to the fact that while the common European species is found throughout the south of Europe and also in Germany, and especially in Saxony, it is unknown in intervening districts, such as Switzerland, where certainly the examination of ants' nests has been carried on extensively.

It is not a little curious that so little is known of the male of Myrmecophila. Although two species of the genus are known in Europe and one of them is not uncommon, Brunner von Wattenwyl says the male is unknown to him, Saussure has but once seen one, and this was destroyed before he could describe the genitalia, and Fischer of Freiburg has seen the male of one species only, and in his classical work refers to it only by the words: "lam. supraanalis mihi non rite visa." It is, however, figured in Cuvier's Règne anim., Disc. ed., pl. 82, fig. 2. Yet in the forty specimens from the United States I have had before me at this time for study, sixteen of them are males, and represent all but one of the five species.

So far as I have been able to observe — the stout hind femora generally interfere with a lateral view — the species do not differ greatly from each other either in the male or the female abdominal organs. The tips of the ovipositor often appear very different in different individuals of the same species, but this is due to desiccation. As to the male organs, little can be seen except a somewhat protuberant and apically rounded haustrate plate, as deep or almost as deep as broad, apically cleft — the subgenital plate; this partially or wholly conceals within its upper margins a pair of not very slender, blunt, cylindrical, incurved cerci, which do not reach the tip of the plate and are overshadowed by a minute triangular or rounded quadrate supraanal plate.

I have given under each species all that I can learn about the special association of these smallest of Orthoptera, and I am glad to acknowledge my indebtedness to Messrs. Pergande and Ashmead through Dr. Howard for determining some of the ants in whose nests they were found. Mr. Pergande's further aid is clear from the text.

Table of the North American species of Myrmecophila.

a^1 Body relatively large or of medium size, broad oval, depressed; hind femora pyriform, distinctly more arcuate below than above.

b^1. Body nearly twice as long as broad; front border of pronotum narrowly margined with luteous . . . . . *pergandei.*

*b*². Body about half as long again as broad, front border of pronotum of same color as disk. . . . . *formicarum.*

*a*². Body relatively small or minute, less broad, convex; hind femora ovate, as arcuate above as below.

*b*¹. Of medium size, the female at least 3 mm. long, generally * very dark castaneous in color . . . . . *oregonensis.*

*b*². Of small or minute size, the female but little if at all exceeding 2 mm. in length, light testaceous in color.

*c*¹. Larger, the female exceeding 2 mm. in length, relatively broad, moderately tomentose, the segments not margined posteriorly with darker color; hind tibial spurs nearly half as long as tarsi. *nebrascensis.*

*c*². Smaller, the female not exceeding 2 mm. in length, relatively slender, sparsely tomentose, the pronotum and succeeding larger segments posteriorly margined rather broadly and feebly with fuscous; hind tibial spurs much less than half as long as tarsi . *nehawkae.*

Myrmecophila pergandei.

Myrmecophila pergandei Brun.! Can. ent., xvi, 42-43, fig. 4 ab (1884); Riley, Stand. nat. hist., ii, 181 (1884); Brun., Publ. Nebr. acad. sc., iii, 33 (1893).

Of large size for this genus, broad oval, about twice as long as broad, depressed, especially behind the prothorax, very sparsely tomentose, testaceo-castaneous, obscurely and somewhat broadly infuscated on both front and hind margins of the pronotum and on the hind margins of the segments behind it, the extreme front margin of the pronotum luteous, the head fusco-testaceous, the antennae as long as the body, luteo-testaceous, luteous basally, the legs testaceous, more or less faintly infuscated. Pronotum truncate in front and behind, the front margin about two thirds as broad as the hind margin, the sides well rounded and considerably deflexed; mesonotum and metanotum equal, much longer than the first or second abdominal segments, which are equal between themselves. Hind femora pyriform, their generally oval shape being slightly produced apically, distinctly more arcuate below than above, less than twice as long as broad; outer hind tibial spurs more than half as long as the tarsi. Cerci moderately slender, about as long as the hind femora; ovipositor slightly longer than that.

Length of the body, 4.25 mm.; breadth, 2.25 mm.

3 ♀. Washington, D. C. with *Formica rufa* in rotten logs, Pergande (Bruner); Same, with *Camponotus pennsylvanicus* (Bruner); Georgia, Morrison. According to Bruner it is also found in Maryland. It is also given by him in his list of Nebraska Orthoptera but probably by mistake.

* Some specimens seen, probably from immersion in alcohol, are testaceous.

With regard to the reference here, and below, to *Formica rufa*, Mr. Pergande informs me that this ant has not yet been found in North America. Prof. Bruner writes that *M. pergandei* is "found most commonly with a large yellowish red ant that lives in rotten logs," which Mr. Pergande tells me is *Camponotus melleus* Say. "I have however found this Myrmecophila," Mr. Pergande adds, "quite frequently in the nests of *Camponotus pennsylvanicus* DeG., *Camp. marginatus* Latr., *Formica subsericea* Say, *Form. integra* Nyl., *Aphaenogaster tennessecensis* Mayr, and *Crematogaster lineolata* Say."

The flatness of the body and its great size renders this species readily distinguishable from all others except the next species, from which it is separable by its slenderer form and luteous edged pronotum, as well as by its being more sparsely tomentose, by the greater length of the thoracic as compared with the abdominal segments, and by its rather longer cerci.

Myrmecophila formicarum sp. nov.

Of large or medium size, broad oval, about half as long again as broad, depressed, especially behind the pronotum, sparsely tomentose, nearly uniform testaceo-castaneous, the head and hinder part of abdomen a little infuscated, the antennae fully as long as the body, luteo-testaceous, luteous basally, the legs luteo-testaceous. Pronotum shaped precisely as in *M. pergandei*; mesonotum and metanotum equal, slightly longer than the first and second subequal abdominal segments. Hind femora subpyriform, distinctly more arcuate below than above, less than twice as long as broad; outer hind tibial spurs fully half as long as the hind tarsi. Cerci moderately slender, slightly inflated beyond the base, distinctly shorter than the hind femora; ovipositor considerably longer than cerci.

Length of body, ♂, 2.75 mm., ♀, 3.75 mm.; breadth, ♂, 1.8 mm., ♀, 2.75 mm.

1 ♂, 3 ♀. Sisson, Cala., Sept. 3, A. P. Morse, with *Camponotus laevigatus* Sm., as determined by Pergande; El Dorado Co., Cala., Feb. (Bruner); Placer Co., Cala., Sept. (Bruner); Coronado, Cala., Blaisdell (Bruner).

This species differs from its nearest ally, *M. pergandei*, in its stouter form and uniformly colored pronotum; from the other species by its flatter body, and from all of them but *M. oregonensis* in its considerably large size; from *M. oregonensis* it may be distinguished by its greater stoutness, lighter color and longer hind tibial spurs.

Myrmecophila oregonensis.

Myrmecophila oregonensis Brun.! Can. ent., xvi, 43 (1884); Fletch., Rep. exp. farms Can., 1888, 63 (1889); Tayl., Ott. nat., xii, 59 (1898).

Of medium or, in female, above the medium size, oval, convex, considerably less than twice as long as broad, sparsely tomentose, densely and most minutely punctate, fusco-castaneous, the head fuscous, the antennae about as long as the body, luteous or luteo-testaceous, the legs and cerci the same, the hind femora sometimes duskier. Pronotum with front and hind margins truncate, the sides well rounded, faintly tumid and

strongly and roundly deflexed, narrowing anteriorly so as to be scarcely two thirds as broad in front as behind; mesonotum and metanotum equal and distinctly broader than the subequal first and second abdominal segments. Hind femora ovate, similarly arcuate above and below, about twice as long as broad; outer hind tibial spurs much less than half as long as the tarsi. Cerci moderately stout, hardly tapering except in apical half, distinctly shorter than the hind femora; ovipositor considerably longer than the cerci and fully as long as the hind femora, luteous, apically dark castaneous.

Length of body, ♂, 3.25 mm., ♀, 3.65 mm.; breadth, ♂, 1.8 mm., ♀, 2 mm.

9 ♂, 8 ♀, besides immature specimens. British Columbia, G. W. Taylor (Bruner); Divide (Cottage Grove) Or., Sept. 12, A. P. Morse; Siskiyou, Or., Sept. 5, A. P. Morse, with *Formica neorufibarbis* Em., as determined by Pergande; Portland, Or., June 19 S. Henshaw, under a stone with ants (Mus. Comp. Zool.). It is reported from Victoria, Vancouver's Island, by Fletcher and Taylor. Dr. Fletcher informs me that it is "common in British Columbia under almost every slab of wood in some places, whether there are ants there or not."

This species is smaller than the two preceding and especially than *M. pergandei*; from both it further differs by its more convex body and from *M. formicarum* by its slenderer form, darker color (though some specimens seen are quite as light, but probably from immersion in alcohol) and shorter hind tibial spurs; from the next species it differs in the points mentioned under that species and from *M. nebawkae* by its much greater size.

Myrmecophila nebrascensis.

Myrmecophila nebrascensis Brun.!, Publ. Nebr. acad. sc., iii, 33 (1893)—undescribed; Lugg., Orth. Minn., 260, fig. 169 (1898)—undescribed.

Of medium size, oval, convex, about half as long again as broad, moderately tomentose, testaceous, sometimes feebly infuscated (in which case the disk of the pronotum is clear), the antennae rather longer than the body, uniform testaceous, occasionally feebly duskier, the cerci the same, the legs pale testaceous. Pronotum with front and hind margins truncate, narrowing so as to be nearly three fourths as broad in front as behind, the sides rounded but not full, strongly and roundly deflexed; mesonotum and metanotum equal and somewhat but not greatly longer than the subequal first and second abdominal segments. Hind femora ovate, similarly arcuate above and below, much less than twice as long as broad; outer hind tibial spurs nearly half as long as tarsi. Cerci rather small, not very slender, tapering only in apical half, very much shorter than the hind femora; ovipositor small, scarcely longer than cerci.

Length of body, ♂, 2.25 mm., ♀, 2.5 mm.; breadth, ♂, 1.5 mm., ♀, 1.65 mm.

4 ♂, 7 ♀. West Point, Nebr., May 6 in ants' nests—*Formica rufa* (Bruner); Santa Fé, New Mex., under a stone, T. D. A. Cockerell, with *Formica exsectoides* Forel, as determined by Ashmead, Aug. Lugger figures it from Minnesota.

As noted above, Mr. Pergande states that *Formica rufa* is not known in

North America. Professor Bruner describes the species so named by him as "the large red ant that builds mounds of sticks, so common throughout a large portion of the northern United States." On asking Mr. Pergande, what this species might be, he replies: "What the particular species is with which *M. nebrascensis* is associated, I am unable to say, though I incline to the belief that it equally frequents the colonies of *Formica pubcrula* Em., *Form. integroides* Em., *Form. rubiginosa* Em., and possibly other forms belonging to the great Rufa group."

This species is easily separated by its size from *M. pergandei* on one side, and *M. nehawkae* on the other; from *M. formicarum* it differs by its more convex body and also by its smaller size; and from *M. oregonensis*, to which it is most closely related, by its smaller size, lighter color, anteriorly broader pronotum, the more equal breadth of the posterior thoracic and anterior abdominal segments, its relatively broader hind femora, longer hind tibial spurs and shorter ovipositor.

Myrmecophila nehawkae sp. nov.

Myrmecophila nehawkae Brun.! MS.

Of minute size, long oval, convex, much more than half as long again as broad, sparsely tomentose, dull testaceous, the pronotum and succeeding segments posteriorly margined rather broadly and feebly with fuscous, the former also narrowly edged with dull luteous in front; head more or less infuscated; antennae scarcely so long as the body, luteous or luteo-testaceous, as are also, but sometimes more pallid, the cerci and legs. Pronotum shaped as in *M. nebrascensis*; mesonotum and metanotum equal and scarcely longer than the subequal first and second abdominal segments. Hind femora ovate, at least as arcuate above as below, not more than half as long again as broad; outer hind tibial spurs much less than half as long as tarsi. Cerci short, rather stout, tapering from a little beyond the base, much shorter than the hind femora; ovipositor fully as long as the hind femora.

Length of body, ♂, 1.75 mm., ♀, 2 mm; breath, ♂, 1.1 mm., ♀, 1.5 mm.

2♂, 3♀. Weeping Water, Nebr., L. Bruner, with *Crematogaster lineolata* Say, as determined by Pergande.

This species differs from all the others by its minute size, being as far as I know the smallest species living, with the exception of that found in S. America. From its nearest ally, the next preceding species, from which it differs also least in size, it is separable by the points brought out in the table.

PERSONAL NOTES. — Dr. J. W. Folsom has left Cambridge for Yellow Springs, Ohio, where he has accepted the chair of natural history at Antioch College. A portion of his recent studies on the Thysanura — the anatomy and physiology of the mouth-parts of Orchesella — has recently been published by the Cambridge Museum of Comparative Zoology.

Dr. A. G. Mayer, the president of the Club, has gone again to the Pacific Islands with Dr. Alexander Agassiz in the U. S. Fish Commission steamer Albatross and will be absent until early in the spring.